

The invention provides four butyrylcholinesterase variants having increased cocaine hydrolysis activity as well as the corresponding encoding nucleic acids. The invention also provides libraries comprising butyrylcholinesterase variants having at least one amino acid alteration in one or more regions of butyrylcholinesterase and further having at least one butyrylcholinesterase variant exhibiting enhanced cocaine hydrolysis activity compared to butyrylcholinesterase. The invention further provides methods of hydrolyzing a cocaine-based butyrylcholinesterase substrate as well as methods of treating a cocaine-induced condition.